Venue Receiver
Digital Hybrid Wireless™

TECHNICAL DATA

Feature Highlights

- **Digital Hybrid Wireless™ system**
- **Six-channel modular configuration**
- **OptiBlend™ Ratio Diversity, SmartDiversity™ Antenna Phase Diversity or Frequency Diversity**
- **256 synthesized UHF frequencies per receiver module**
- **DSP based pilot tone**
- **DSP emulation modes for compatibility with analog wireless systems in addition to the Digital Hybrid mode**
- **LCD interface for setup and monitoring**
- **USB and RS-232 computer interface**

The Venue Receiver is a modular UHF design that operates with Digital Hybrid Wireless™ transmitters, and a variety of analog transmitters. The receiver uses a host assembly that includes an antenna multi-coupler, computer communications interface and mechanical rack mounting for up to six receiver modules.

Using a revolutionary new design that combines 24-bit digital audio with an analog FM radio link, Digital Hybrid Wireless™ provides outstanding audio quality with the extended operating range of the best analog wireless systems. The design overcomes channel noise in a dramatically new way, digitally encoding the audio bitstream in the transmitter and decoding it in the receiver, yet sending the encoded information via an analog FM wireless link. The proprietary DSP algorithm eliminates a compandor circuit and its artifacts, and preserves the RF spectral footprint of analog FM designs to simplify multichannel coordination with existing analog wireless systems.

The VR's design offers a tremendous degree of flexibility. For example, each of the three pairs of receivers can be combined and used for ratio diversity or frequency diversity reception. Each individual receiver can be used by itself for phase switched diversity reception. Combinations of reception techniques can be used at the same time.

The compatibility modes are also independent between the receivers, so some channels can be used in the native hybrid mode while others might operate with in and analog mode to work with other transmitters.

Three different diversity modes can be selected: SmartDiversity™, OptiBlend™, or Frequency Diversity.

SmartDiversity™ - a microprocessor controlled antenna phase switching in 180 degree increments to minimize dropouts caused by multi-path reflections. Each receiver outputs a single audio channel, so the overall system can provide up to six channels per Venue Receiver.

OptiBlend™ diversity - a ratio diversity audio combining process that mixes the audio outputs from two adjacent modules in a ratio controlled by the relative RF signal levels at the receivers.

Frequency Diversity - an automated redundancy process that pairs two transmitters with two adjacent receiver modules. (Each transmitter/receiver pair is tuned to a different frequency.) The RF signal level at each receiver is monitored and the audio component blended similar to ratio diversity. This virtually eliminates problems associated with strong RF interference or failing transmitter batteries.

Digital Audio Systems

Without question, digital audio systems produce stellar sound quality very inexpensively. Advances in processing speeds and storage media in recent years have made digital techniques the undeniable choice for professional audio applications.

Analog RF Links

While digital audio systems are obviously superior to analog audio systems, RF transmission system designs are challenged by limited bandwidth. Wireless microphone systems operate in designated channels defined by spectral bandwidth. The government in almost every country regulates the channel spacing and a spectral mask limiting the amount of energy that can be transmitted above and below the center of the channel. The RF energy from the transmitter must remain inside the spectral mask defined by the government in the country where the wireless system is to operate.

All else being equal, a digitized audio signal occupies a good deal more bandwidth than the original analog audio signal. The same applies to digital and analog RF signals. A digital transmission over the air requires some combination of additional power, more RF bandwidth and/or compression of the audio data to achieve adequate operating range and keep the energy inside the defined spectral mask. Because of this, digital wireless microphones typically lack the operating range of conventional FM systems.

With regard to using RF power and spectrum efficiently, an analog RF link has many advantages in wireless mic systems, among them long battery life, excellent range, and the ability to use many systems in close proximity without interference.

Digital Hybrid Wireless™

The Lectrosonics Digital Hybrid Wireless system* uses innovative technology to combine the advantages of digital audio with the advantages of analog RF transmission, thus delivering the excellent range of an analog system and the superior sound quality of a digital system. A proprietary algorithm encodes the digital audio information into an analog format which can be transmitted in a robust manner over an analog FM wireless link. The receiver employs the latest filters, RF amplifiers, mixers and detector to capture the encoded signal and a DSP recovers the original digital audio.

This digital/analog hybrid technique has some very beneficial properties. Because the information being transmitted is digitally encoded, immunity to noise is much higher than a compandor can offer. Because the encoded audio is sent in analog format, spectral and power efficiency and operating range are not compromised. Under weak RF conditions, the received signal degrades gracefully, like an analog system, delivering as much usable audio as possible at maximum range. Because the audio is not companded, no compandor artifacts are present at any audio or RF signal level.

DSP-Based Pilot Tone

The 400 Series system design uses a DSP generated ultrasonic pilot tone to control the receiver audio muting (squelch). Brief delays at turn-on and turn-off eliminate thumps, pops or other transients that can occur when the power is switched on or off. The pilot tone frequency is different for each of the 256 frequencies in the tuning range of a system (frequency block). This eliminates squelch problems in multichannel systems where a pilot tone signal can appear in the wrong receiver via intermodulation products. The DSP generated pilot tone also eliminates fragile crystals which allows the receiver to survive shocks and mishandling much better than older crystal-based analog-based pilot tone systems.

Note

The above describes a system configured for Digital Hybrid Wireless™ Compatibility Mode. Older analog transmitters (or transmitters from other manufacturers) either use one pilot tone frequency, or none at all.

DSP Compatibility Modes

While the Venue Receiver sounds best when used in the Digital Hybrid Wireless™ mode, it also offers backward compatibility with earlier technologies, including the Lectrosonics 100 and 200 Series and another brand of wireless transmitters. The VR also ensures exact time alignment of the audio outputs in the event that digital and analog transmitters are used simultaneously. The compatibility mode is selected with the LCD interface or computer software.

Controls and Monitoring

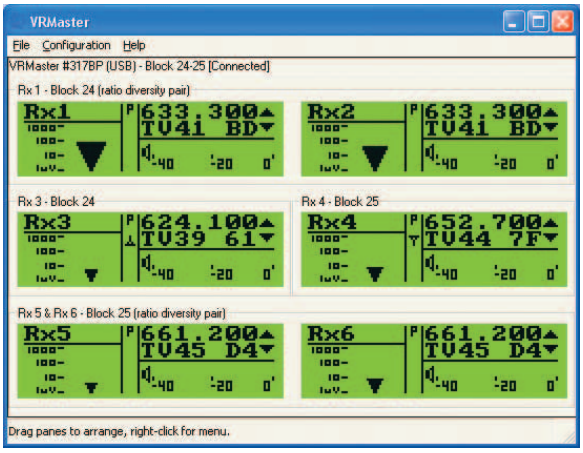
Setup options and adjutments can be made via the front panel LCD interface, or with an attached computer. USB and RS-232 ports are available on the rear panel. The LCD interface consists of six channel select switches, two selection and navigation switches and a pushbutton rotary encoder control. A computer, or touch screen control system, can be connected for setup or continuous system monitoring via either the USB or serial port.

50 Ohm BNC multicoupler output jacks provide zero-gain antenna "loop-throughs" for an additional receiver, allowing convenient expansion without the need for an external RF multi-coupler.

LecNet2™ software

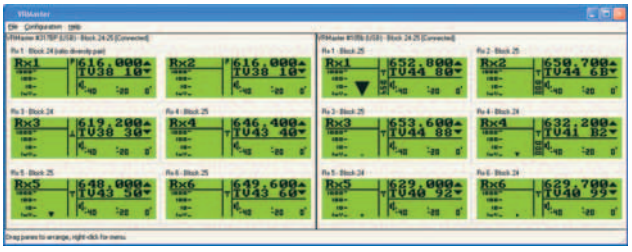
The software included with the Venue Receiver simplifies setup and monitoring, and allows the VR to become an integral part of a powerful automated wireless audio system. Once configured, the VR runs without a host computer.

This software is part of LecNet2™, a new, user friendly, simple to use yet powerful package that runs under Windows® 2000/NT/XP* operating systems.



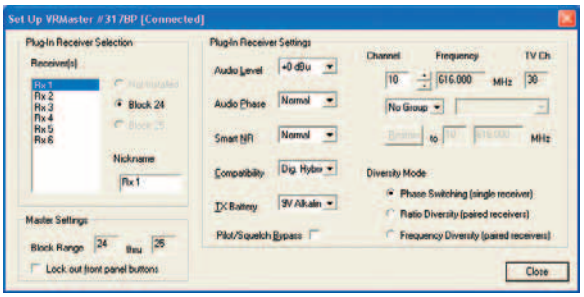
VR Main Screen

The VR Main Screen automatically resizes when additional VR Master Units are added to the system. Simply dragging and dropping the VR Master Units allows you configure the monitor display to individual tastes. More than 96 individual receivers (16 VR Master Units, each with a full complement of receiver modules) can be monitored simultaneously.



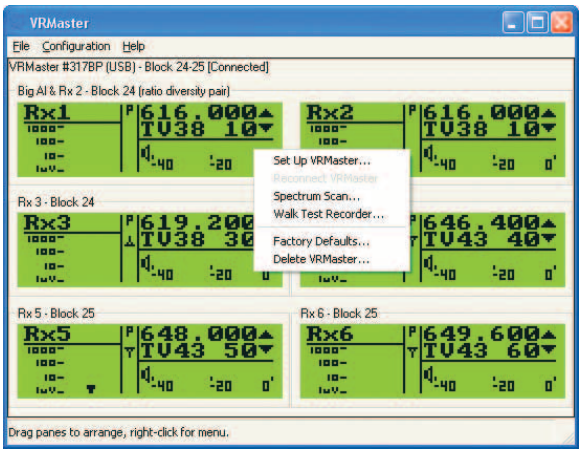
This VR Main Screen illustrates how two independent VR systems with six receivers each can be easily monitored at the same time..

Double-click any one of the receiver modules to pop up the Set Up VRMaster dialog box which displays the settings for each receiver module installed in the selected VR Master. This screen also allows tuning of selected receiver modules, setting their individual compatibility modes, selecting diversity modes and setting audio output levels.



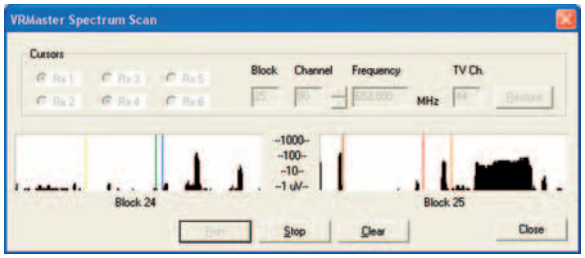
Set Up VR Master dialog box

Right clicking any one of the receiver modules pops up a menu with additional functions available for the associated VR Master Unit to the user, including a spectrum scanner and walk test recorder.



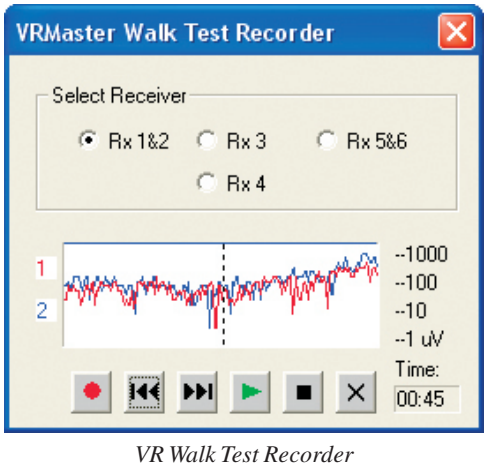
VR Set Up Screen

The spectrum analyzer provides a visual display of RF activity within the tuning range of the system to quickly locate clear operating frequencies. Convenient Block, Channel, Frequency and TV Channel are displayed for the selected receiver simplifying setup of the associated transmitter.



VR Spectrum Analyzer

A unique walk-test recorder is provided to verify system performance as the transmitter moves through the area of operation. RF level is recorded during the walk test in a scrolling window. During playback a “strip chart” scrolls past the cursor. By mentioning locations during the walk test, it is possible to quicky identify potential trouble spots.



VR Walk Test Recorder

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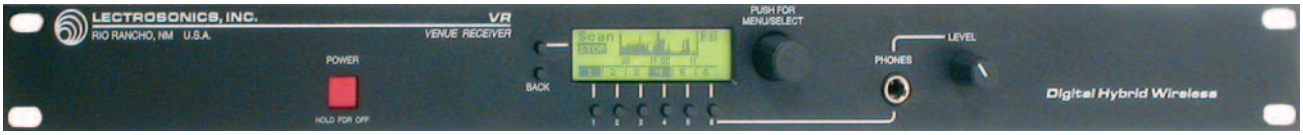
Front Panel



The front panel provides an easy-to-use LCD interface for setup, and provisions for quick monitoring to assist in troubleshooting. In normal operation, the LCD shows RF and audio levels, diversity status, pilot tone status (where applicable) and transmitter battery status (when available) for all six receivers at the same time. Individual screens for each receiver are also available to provide additional information and setup adjustments.

A headphone jack and level control is provided for individual channel monitoring.

Rear Panel

The rear panel provides six balanced audio outputs on standard XLR connectors, 50 ohm BNC antenna inputs, 50 ohm BNC antenna outputs from the built in zero-gain multicoupler, power jack with a locking connector, USB port and RS-232 serial port for the computer interface.

The unit is powered from an external source at 10 to 18 VDC, allowing the unit to operate from a wide variety of sources in stage, studio and mobile applications.

SPECIFICATIONS

Note: Some specifications apply only when the receiver is operating in the 400 Series (Digital Hybrid) mode.

Operating Frequencies (MHz) for Receiver Modules:

Block 21	537.600 - 563.100
Block 22	563.200 - 588.700
Block 23	588.800 - 607.900 and 614.100 - 614.300
Block 24	614.400 - 639.900
Block 25	640.000 - 665.500
Block 26	665.600 - 691.100
Block 27	691.200 - 716.700
Block 28	716.800 - 742.300
Block 29	742.400 - 767.900

Digital latency: 1.5 mS receiver only)
3.2 mS (whole system) with Hybrid transmitter

Frequency selection: 256 frequencies in 100 kHz steps

Dual Block Range: Built in antenna mulitcoupler covers a two block range.

Block 21/22	537.600 - 588.700
Block 22/23	563.200 - 614.300 (excluding 608.000 to 614.000)
Block 23/24	588.800 - 639.900 (excluding 608.000 to 614.000)
Block 24/25	614.400 - 665.500
Block 25/26	640.000 - 691.100
Block 26/27	665.600 - 716.700
Block 27/28	691.200 - 742.300
Block 28/29	716.800 - 767.900

Pilot tone: 25 to 32 kHz; 5kHz deviation; unique pilot tone frequency for each selected carrier frequency, (Hybrid mode)

Deviation: ± 75 kHz (max), (Hybrid mode)

Receiver Type: Triple conversion, superheterodyne

Frequency Stability: ±0.001 %

Front End Bandwidth: ±50 MHz @-3 dB (VR-Master)

Sensitivity (20 dB Sinad): 0.9 uV

AM Rejection: >60 dB, 2 uV to 1 Volt

Image and Spurious Rejection: 85 dB

Third Order Intercept: +10 dBm

Diversity Methods: Switched, ratio and frequency

FM Detector: Digital pulse counting detector @ 300 kHz

Audio Performance (overall system):

Frequency Response: 32 Hz to 20 kHz (+/-1dB), overall system (400 Series mode)

THD: 0.2% (typical), (400 Series mode)

SNR at receiver output (dB) (in Hybrid operating mode): 107 dB (SmartNR™ @ FULL and receiver in limiting)

Input Dynamic Range: 125 dB (with full trasnmitter limiting)

Audio Output Level: -15 dBu to +8 dBu, in 1 dB increments

LCD: 122x32 graphical display

Power Requirements: 10 to 18 VDC; 900 mA at 11VDC

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